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AUTHOR	Fincher, Cameron
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ABSTRACT

The use of the Scholastic Assessment Tests (formerly the Scholastic Aptitude Test) (SAT) for assessment in the Georgia university system was studied. The study involved more than 243,000 students entering the University of Georgia over a 25-year period and used at least 883 different regression equations to correlate high school average (HSA), SAT verbal and mathematics scores, and grade point average. For male and female students entering the university system, HSA is the best predictor. When averaged across the 25 years, the results demonstrate the influence of race and sex on academic achievement in the university system of Georgia. The meta analysis of SAT scores also suggests that institutional level may be a modifier worthy of consideration. Data suggest that the SAT, as a measure of verbal and mathematical ability, and as an indication of the applicant's readiness to meet academic responsibilities, finds many uses in the University System of Georgia. Data also suggest that SAT scores should be treated differentially by race and by sex within the University System of Georgia. (SLD)

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by Cameron Fincher

The College Board Scholastic Aptitude Test (SAT) was first administered in 1926 to over 8000 candidates to colleges in the northeastern section of the United States. The first SAT was a multiple choice examination consisting of nine subtests: definitions, arithmetical problems, classification, artificial language, antonyms, number series, analogies, logical inference and paragraph reading. In subsequent years the number of subtests was reduced to six. Later the SAT was divided into two separate sections, one section dealing with mathematical ability and the other dealing with verbal ability. With minor modifications, the SAT has remained a test of verbal and mathematical abilities much as it had been developed by 1929.

The SAT was originally conceived as a measure of academic ability that would be independent of high school preparation, teacher judgments, and high school grades. Its primary use over the years has been the prediction of freshman grades and selective admissions to institutions with more applicants than classroom facilities. Institutions using the SAT have been located primarily in the northeast, and users of the SAT continue to be located primarily on either the eastern seaboard or the west coast of the United States.

In 1957 the SAT was adopted for use in the University System of Georgia, one of the first states to adopt the SAT for statewide use in institutions of public higher education, a system that then consisted of 18 institutions and which now consists of 33 institutions of higher education. The Georgia system of public higher education is a three-tiered system. There are four institutions that are accorded university status; fourteen are identified as senior or four-year institutions, and fifteen institutions are regarded as two-year or junior colleges.

The adoption of the SAT in Georgia institutions of higher education met with reluctance. It was first thought that the test was too difficult for a majority of students entering public colleges, and tentative efforts were made to extend the scale downward. These efforts proved to be needless. Research demonstrated that the test could discriminate levels of academic ability at the lower end of the SAT-Verbal and the SAT-Math scales. Thus no extension of the two scales was necessary.

The initial uses of the SAT in Georgia institutions were predictive. The predictive validity of the SAT was established for the separate institutions of the University System and a central office of testing and guidance issued annual norms booklets in which regression equations, score distributions, and predictive indices were given for each of the 18 institutions of the University System. Over 26 years of research into the predictive efficiency of the SAT are now available and represent the largest pool of information concerning the SAT in a statewide system of public education.

WHAT DOES THE SAT MEASURE?

The SAT is neither an intelligence test per se nor an educational achievement test, but a mixture of both. The verbal scale of the

SAT is basically vocabulary and reading comprehension, and by implication, an index of student facility in linguistic concepts and expression. The mathematical scale is basically a measure of the student's ability to deal with numerical symbols, analyze quantitative relationships, and to interpret mathematical problems. In this manner the SAT is a measure of the student's ability to analyze and interpret written materials of the kind encountered in academic coursework. The specific nature of the items, of course, were antonyms, analogies, sentence completions and paragraph comprehension on the verbal scale-and arithmetical computation on the mathematic scale. No total or combined score is reported for the SAT because it is not thought desirable to summate the two scores. Indeed, the verbal scale has the backing of the trivium (rhetoric, grammar, and logic) and the mathematics scale is representative of the quadrivium (astronomy, geometry, music, and arithmetic) in the curriculum of the medieval university. As indicated by the president of Educational Testing Service in his annual report of 1961-62, the SAT is "quite simply a highly reliable measure of verbal and mathematical ability" and "as such it serves both students and colleges well."

HOW WELL DOES THE SAT PREDICT?

An extensive study of the SAT in 1974 showed that the SAT is indeed useful to both students and colleges. Thirteen years of data from the University System norms booklets were analyzed on the premise that the value of the SAT did not lie in its ability to directly and independently predict college performance, but in its incremental effectiveness when used in conjunction with high school records. In other words, the College Board had long advised against the use of the SAT as a single, absolute measure of academic ability and had consistently recommended that the SAT be used in conjunction with other information such as high school records and achievement test scores. The Board has long pointed out that the high school average or class rank is the best single predictor of college grades and that the advantage of using the SAT is as a supplement to high school grades or other indications of prior educational achievement.

Uses of the SAT have often combined high school averages and SAT scores as multiple predictors of freshman grade-point-averages. The relative contributions of SAT verbal and SAT mathematic scores vary, of course, from institution to institution within the University System. Statistical analysis reveals, however, that the SAT verbal score contributed significantly to the prediction of freshman grades from 70 to 80 percent of the time while the SAT mathematics score contributed approximately 50 percent of the time. Both the SAT verbal and the SAT math scores contributed from 30 to 40 percent of the time. Only in approximately 10 percent of the cases did neither the verbal nor the mathematics scores contribute significantly to the prediction of freshman grades.

The analysis of SAT scores over a 13-year period suggested that the public institutions of Georgia could be classified by the mean SAT verbal scores recorded over the years. The university-level institutions consistently had a mean SAT verbal score of 450 or higher, while the four-year senior colleges had an SAT verbal between 400 and 450. junior or two-year colleges in the state had a mean verbal score somewhere between 300 and 400. The level of the SAT verbal scores, however, was not related to the extent with which they correlated with college grades. For example, the SAT verbal score of males correlated .36 with grades in junior colleges, .37 with senior college grades, and .35 for university-level grades. Correlations for female students were .50, .53, and .45 respectively.

The study consistently showed that a combination of SAT scores and high school grades provided the best prediction of college grades. The data also showed that there was some slight loss in predictive efficiency

whenever SAT scores were combined prior to their insertion in a regression equation. Multiple correlation coefficients with a differential weighting of SAT-V + SAT-M + HSA were .58 for men students and .70 for women students during the years studied. There were no detectable differences among the three levels of institutions for either males or females.

The predictive efficiency of the SAT was demonstrated by computing an index of forecasting efficiency for the HSA alone and then computing an index of forecasting efficiency for the combination of high school averages and SAT scores. The average gain found in this manner was 6 percentage points for males and 8 percentage points for females. The author concluded from the study that the use of the SAT reduced the predictive error an additional 6 points (or 46 percent) for male students and an additional 8 points (or 43 percent) for female students.

The study concluded that while the predictive efficiency of the SAT had been amply demonstrated, the use of the SAT should not be based on the increased accuracy of predicted grades alone. There were many indications that numerous benefits had accrued from the use of the SAT over the 13-year period. The norms booklets distributed annually by the University System of Georgia depicted the diversity of institutions within the System and the differential attraction of students with varying levels of high school preparation and measured ability. The normative data gave high school counselors accurate and reliable information about the various institutions of the University System. In turn, the data contained in the norms booklets gave high school seniors appreciable information about the relative difficulty of academic success in the public institutions of Georgia.

Later studies verified the findings of the first study. The high school average continued to correlate roughly .50 with freshman grades for both male and female students. The SAT verbal scores and the SAT math scores continued to correlate between .39 and .46 while a combination of SAT-V and SAT-M with high school averages continued to give a multiple correlation coefficient of approximately .60 or better. Indices of forecasting efficiency continued to show again of somewhere around 6 percentage points for males and around 8 percentage points for females. Here the author of the study again concluded that a combination of high school averages and SAT scores would predict freshman grades "just about as well" as one should expect to predict future performance in the college classroom.

ADULT LEARNERS

A system-wide study of adult learners in 1983 confirmed many of the earlier findings concerning the traditional college-age population of 18 to 24 years. For purposes of the study, adult learners were defined as students over 24 years of age who were entering college for the first time. Inquiries to the 33 institutions of the University System of Georgia resulted in the identification of an adult learner population of 1,694. As found in other studies, a majority (65 percent) were female and a majority (83 percent) were white. In age, a substantial majority (86 percent) were under 41 years of age. Less than 6 percent of the adult learners were over 45 years of age.

Performance on the SAT was influenced appreciably by the sex, age, and race of the adult learners. The age of the adult learners correlated +.10 with SAT verbal scores and -.13 with SAT math scores. Race or ethnic group correlated +.40 with SAT verbal and +.29 with SAT math. Sex correlated -.16 with SAT verbal and +.11 with SAT math.

The intercorrelations of SAT-V, SAT-M, high school average, and freshman grades for adult learners were much as expected. Cumulative grade-point-average, as opposed to first quarter grades, correlated best with combinations of SAT scores and high school grades. This finding suggested that adult

learners have some difficulty in adjusting to the demands of college coursework and that two or more quarters are necessary for them to cope successfully. The multiple correlation for HSA, SAT-V, and SAT-M was, however, somewhat depressed from that established for younger student groups. The multiple correlation coefficient for the total group was found to be .43, a figure which accounts for some 18 percent of the variance in college achievement. As expected, the multiple correlation coefficient for female students (.44) was somewhat higher than for male students (.31). A similar difference was found for white students (.42), as opposed to black students (.26). Only a minor difference was found, however, for age groups. Students aged 25-30 years had a multiple correlation coefficient of .44 while those aged 31-50 had a multiple correlation of .42.

As indicated earlier in the correlation of SAT scores and high school average with cumulative grade-point-average, the multiple correlation coefficient tended to increase with the number of academic hours earned. For example, students earning less than 15 credit hours displayed a multiple correlation of .41 while those earning more than 25 hours displayed a multiple correlation of .49.

Multiple correlation coefficients were affected noticeably by the type of institution in which the adult learners enrolled. Students enrolling in two-year or four-year colleges, displayed a multiple correlation of .49 and of .46, whereas those enrolling in a university-level institution displayed multiple correlation of only .22. Another difference was found between students enrolling for a bachelor's degree, as opposed to an associate degree. The multiple correlation for adult learners in bachelor's programs was .49 whereas the multiple correlation for those in associate degree programs was .43.

The adult learners study suggests that a higher correlation with grade-point-averages (GPA) in college is obtained when adult learners have earned over 25 hours of academic credit in a four-year institution where they are seeking a bachelor's degree. In such cases, the combination of HSA, SAT-V, and SAT-M can account for approximately one-fourth of the variance observed in GPAs of adult learners.

The usefulness of the SAT in predicting adult learning is again seen in the incremental effectiveness of SAT verbal and SAT math scores when they are used in combination with high school grades. The combination of SAT scores and high school grades does not account for as large a proportion of the adult learner variance as it does for traditional-age students. For adult learners the multiple correlation coefficient is +.43 and the multiple coefficient of determination is .1849. For traditional college-age students the multiple correlation coefficient is +.59 and the multiple coefficient of determination is .3481. It is relevant, therefore, that for a group of adult learners who have no high school average but who have been admitted on a basis of other tests, SAT verbal and SAT math scores correlated +.32 and +.24 with grade-point-averages. These coefficients are almost identical to those computed for the total group of adult learners.

Among the conclusions drawn from the adult learners study were: (1) Scores on the SAT need not be a deterrent to adult learners as they seek education beyond the high school, (2) The multiple correlation of SAT scores and high school grades is not as substantial as that reported for traditional college age students, but it is statistically significant and it is relevant, and (3) Age, sex, and race are related to performance on the SAT and to performance in high schools and college; age does not seem to be as much of an influence as do sex and race.

A META-ANALYSIS OF 25 YEARS DATA

A study of the University System of Georgia's cumulative experience with the SAT has been made using meta-analysis techniques. This study has involved over 243,000

A SUMMARY OF FINDINGS

- This study has involved over 243,000 students entering units of the University System of Georgia over a 25-year period and consists of at least 883 different regression equations in which HSA, SAT-V, SAT-M, and GPA have been correlated.

- For male students entering units of the University System, the high school average is the best single predictor of freshman grades and correlates +.49 with GPA. SAT scores correlate .35 for SAT-V and .39 for SAT-M. When computed as a multiple correlation in which the three predictor variables are weighted differentially, the average multiple correlation coefficient over the 25- year period is .58.

- For female students, the high school average again is the best predictor, correlating .55 with freshman grades. SAT-V correlates .46 and SAT-M correlates .46. The multiple correlation coefficient for SAT-V + SAT-M + HSA is a robust .64.

- When averaged across the 25-year period, the results demonstrate further the influence of race and sex upon academic performance within the University System of Georgia. The mean correlation for males attending historically black institutions is .31 while the mean correlation for males attending predominantly white institutions is .35. For females the correlations are .38 for HBIs and .47 for predominantly white institutions.

- The mean multiple correlation for males attending historically black institutions is .53 while mean correlation for males attending predominantly white institutions is .59; for females the mean multiple correlation is .58 for historically black institutions and .65 for predominantly white institutions.

- The meta-analysis of SAT scores also suggests that institutional level may be a modifier variable worthy of consideration. At the university level, the weighted mean correlations of SAT-V are .33 males and .41 for females. At the four-year, senior college level the weighted mean correlations for SAT-V are .38 for males and .51 for females. At the two-year college level the weighted mean correlations are .37 and .50 respectively. A similar pattern is found for SAT-M. Although the differences in the weighted mean correlation are not as noticeable for SAT-M, there are enough differences to suggest that the weighted mean correlation of SAT-M is somewhat higher in the two-year and four-year colleges than it is at the university level.

- These data more than any other suggest that all SAT scores should be treated differentially by race and by sex within the University System of Georgia.

students entering units of the University System of Georgia over a 25-year period and consists of at least 883 different regression equations in which HSA, SAT-V, SAT-M, and GPA have been correlated. Because of the large number of subjects involved in the study and because of the large number of equations, there is little observed variance in the mean correlations computed over the 25 years, and from 37 to 43 percent of the observed variance in the correlation coefficients can be attributed to sampling error.

The analysis shows that almost 41 percent of the variance in academic achievement by female students in the freshman year can be accounted for by prior preparation in high school and by verbal and mathematical abilities, as measured by the SAT. For male students, the differential weighting of SAT scores and high school grades can account for almost 34 percent of the variance in freshman grades. Such analysis of SAT scores and high school grades suggests that approximately 60 percent of the variance in freshman grades for females remain unaccounted for while approximately 64 percent of the variance in freshman grades for males is similarly unexplained. Thus, the conclusion many years ago that we can predict freshman grades as well as we should hope to do so. The unexplained variance of freshman performance—all educators should trust—can be accounted for by such conditions as student effort and quality of instruction.

In brief, the SAT, as a measure of verbal and mathematical abilities and as an indication of the applicant's readiness to meet academic responsibilities, finds many uses in the units of the University System of Georgia. Users of the SAT are familiar with the test and know of its long use within the University System. As would be expected, however, the test may not serve as well at lower levels of ability. The most important conclusion to be drawn from the study, nonetheless, is that the SAT is most valuable in the articulation of students from secondary schools to units of the statewide system of public higher education. Continued use of the SAT in the University System of Georgia should not be justified on the basis of its predictive validity alone—but on the basis of the valuable information the SAT provides on student abilities and achievement.

THIS ISSUE . . .

This issue of IHE PERSPECTIVES is a reprint of a paper presented in 1985 at the 11th Annual Conference of the International Association for Educational Assessment. In 1985 the SAT was known as the Scholastic Aptitude Test, but even then, some of us regarded the SAT as the most useful way in which we could assess verbal and mathematical abilities.

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